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ALBACORE TROLLING EXPLORATION ACROSS THE NORTHERN PACIFIC, 1976

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Introduction

This is the second time that U.S. albacore jig fishing vessels have conducted exploratory fishing efforts for albacore in the western North Pacific. A major objective of the survey was to evaluate the possibility for jig fishing for albacore in the western Pacific, especially in the vicinity of the Emperor Seamount chain near 35°N and 170°E. Secondary objectives were to gain information for use in migration studies of North Pacific albacore and the association of albacore with oceanographic features. Also, the vessels carried on fishing operations to assess and evaluate the possibilities for jig fishing for albacore and other tunas along the Hawaiian Island chain.

The fishing vessels, Typhoon with Captain Keith Coburn and Santa Ines with Captain Danny Romero, participated in the exploratory fishing operations. One of these was chartered by the American Fishermen's Research Foundation (Typhoon) and the other by the Pacific Tuna Development Foundation (Santa Ines).

Background Information

The area where the jig vessels conducted fishing operations was chosen on the basis of (1) the location where the Japanese live-bait

fishery has operated in recent years during June, (2) locations where tagged albacore have been recovered, and (3) the experience of U.S. trollers which carried on exploratory fishing operations in 1975. The Japanese live-bait fishery for albacore generally commences in March to April and is carried out over a broad latitudinal range roughly between 25 to 40°N and within a few hundred miles of Japanese home islands. As the season advances, the fishery moves eastward in a progressively narrowing latitudinal band. Near the end of the Japanese live-bait fishery, which usually occurs in June or July, the fish appear to follow a narrow, well-developed emigration route extending over only a couple degrees of latitude and centered in the Emperor Seamount area at about 35°N, 170°E. In 1974 and 1975 large numbers of albacore which were tagged in the eastern Pacific as part of the cooperative NMFS/AFRF albacore tagging program were recovered mostly in the month of June in the vicinity of the Emperor Seamount. Also, daily albacore catches made by the three U.S. jig vessels during the 1975 exploratory fishing survey were highest in the vicinity of the Emperor Seamount.

Survey Operations

The vessels conducted exploratory fishing using standard commercial fishing methods. They also cooperated with the NOAA/NMFS Southwest Fisheries Center in keeping detailed daily fishing logs, making daily oceanographic observations (including surface and subsurface temperature measurements), making marine weather observations, conducting albacore tagging operations, and collecting specimens for biological and chemical analyses.

Cruise Track

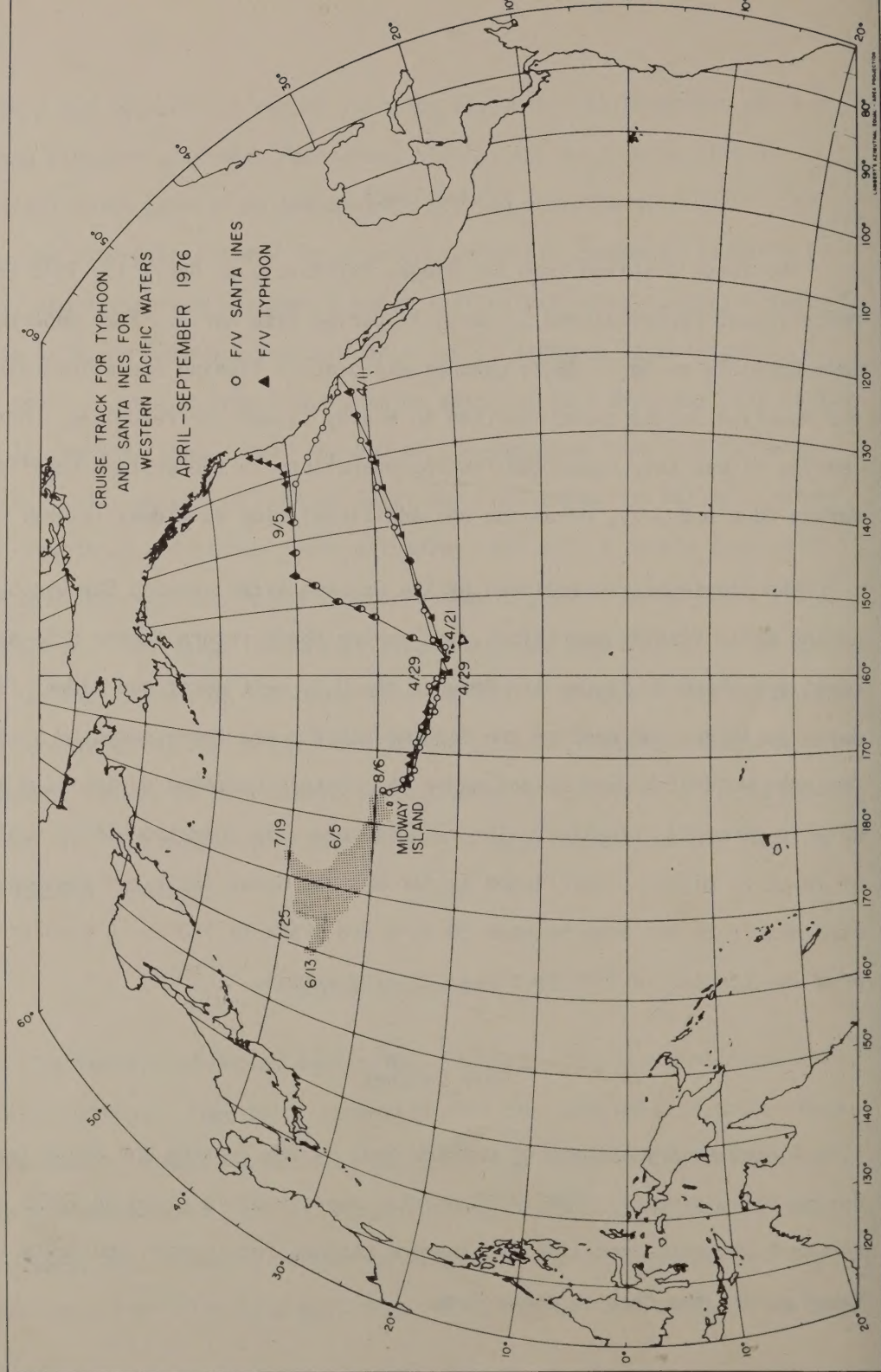
The vessels sailed from San Diego, California on April 11, 1976 and refueled and reprovisioned in Honolulu during late April. They departed from Honolulu on April 28 to conduct exploratory fishing operations along the Hawaiian Island chain and then to Midway Island for refueling. After leaving Midway they conducted fishing operations in the western Pacific during June and July, refueling one additional time at Midway Island.

The cruise tracks followed by the vessels after leaving San Diego, during their fishing operations, and during their return to the U.S. west coast are shown in Figure 1. Between the U.S. west coast and Midway Island daily positions for each of the fishing vessels are represented by symbols. The area west of Midway Island where the vessels operated during June and July is shown by stippling. The vessels generally operated with a spacing of 10 to 70 miles. They fished as far west as about 158°E but they operated mostly in the area between 30-40°N and 175°W to 160°E. A similar area was scouted in 1975 by three U.S. jig vessels.

Fish Catches

A preliminary summary of catches made by the Typhoon and Santa Ines during the mid-Pacific AFRF/PTDF charter operations is given in Table 1. Figure 2 shows the total daily albacore catches for Typhoon and Santa Ines taken during the charter operations.

Figure 1. Cruise track for 1976 AFRF/PTDF exploratory albacore fishing survey across Northern Pacific.



Albacore Catches

The vessels caught approximately 32,000 pounds of albacore. Daily catches of albacore were generally low, with the exception of a few days when catches in excess of 200 fish were made. The highest daily total catch for the two vessels was 732 fish. Best catches were made in the area between 35°-39°N and 163°-171°E. Virtually no catches of albacore were made between the Hawaiian Islands and 174°E, and only small catches were made on a few days while fishing/travelling from the west coast to the Hawaiian Islands and return. The size of albacore ranged from 5-35 pounds with 12-18 pound fish predominating.

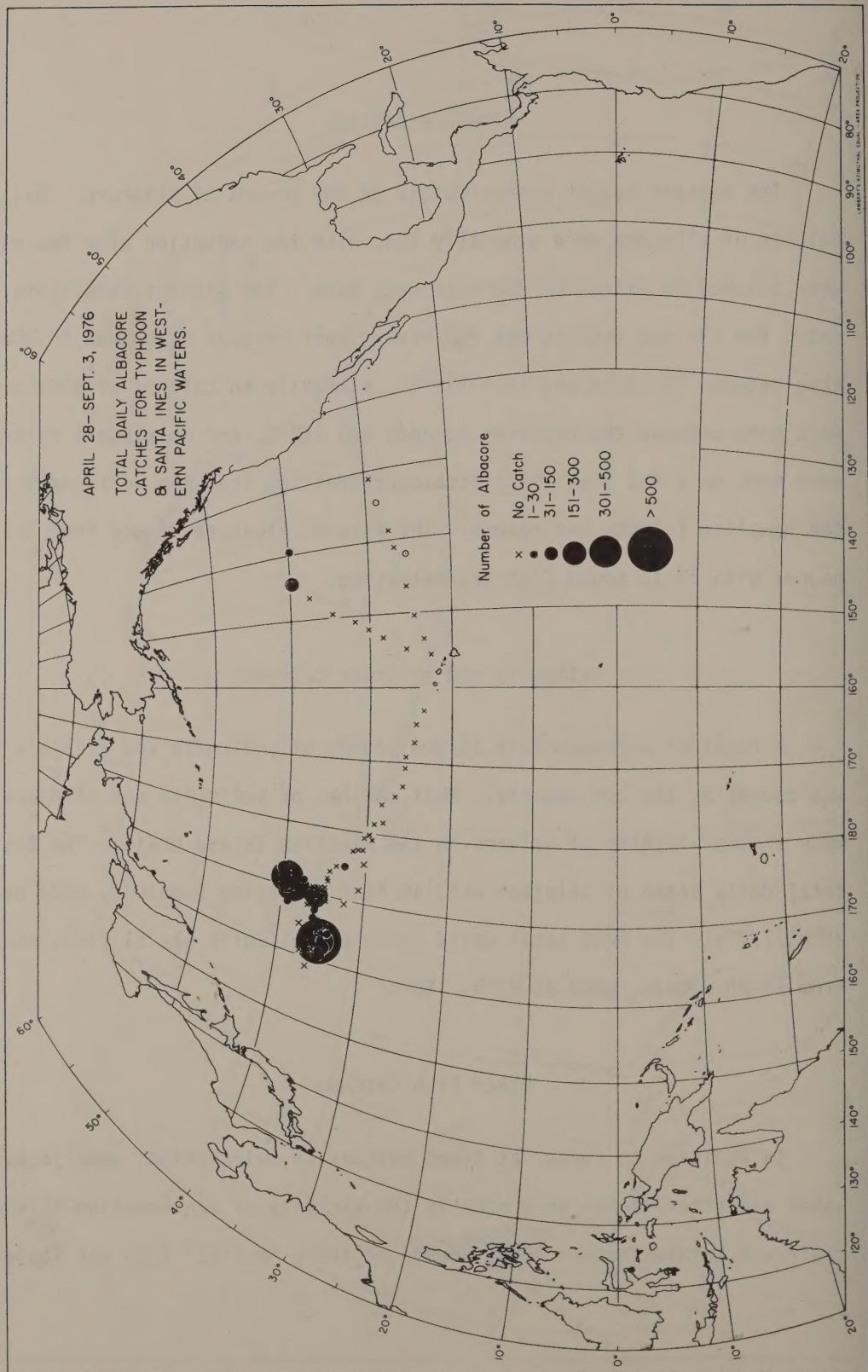
Yellowfin and Skipjack Catches

A total of approximately 12,000 pounds of yellowfin and skipjack tunas was caught by the two vessels. Most catches of yellowfin and skipjack were made in the vicinity of islands in the Hawaiian Island chain. The best total daily catch of skipjack was 140 fish averaging 9 pounds, made near 28°N, 177°W. The best total daily catch of yellowfin was 51 fish, ranging from 12-80 pounds, made at 23°N, 165°W.

Other Fish Catches

In addition to tunas, at times catches of dolphinfish, amberjacks, wahoo and other fishes were made in the vicinity of the Hawaiian Island chain. A total of about 1,000 pounds of these "market" fish was landed.

Figure 2. Total daily albacore catches made during 1976 AFRF/PTDF
exploratory fishing survey across Northern Pacific.



Preliminary Summary of Catches Made by Typhoon and Santa Ines During
Mid-Pacific AFRF/PTDF Charter Operations.

Date	Latitude and Longitude	Albacore		Yellowfin No. Size	Skipjack No. Size	Other fish	Remarks
		No.	Size				
4/28	21°16'N 157°48'W			8 16-26#			Depart Honolulu 0930 PST; all running well
4/29	23°04'N 161°54'W			26 8-25#		3	Off Nihoa Island
4/30	23°16'N 163°06'W			51 12-80#	24 5-12# 2 8-10#	2+	Miscellaneous dolphin and black skipjack
5/1	23°35'N 165°33'W					4	
5/2							No record
5/3	25°12'N 168°36'W			29 10-50#	6 6-8#	6+	Catch made in Gardner Pinnacles area; 74°F H ₂ O to 300'; few birds
5/4	25°30'N 171°00'W					26	74.5°F H ₂ O to 300' - 73°F
5/5	25°55'N 173°00'W			1 20#		1+	Miscellaneous amberjack; 74°F sea-surface temperature; calm; Santa Ines reported 1 good school of yellowfin with porpoise and birds
5/6	26°50'N 174°50'W						Miscellaneous dolphinfish and amberjacks; left Lysianski this a.m.; 74.5°F sea temp.
5/7	28°04'N 176°37'W			5 8-12#	1+	1+	71°F Sea Temp.; miscellaneous wahoo, skipjack and amberjack.
5/8	28°12'N 177°22'W						No transmission; arrived Midway Island
5/9	30°17'N 178°35'W			3 6-8#	1+	1+ Amber-jack	Russian trawler fishing near position given; 70°F H ₂ O.

Date	Latitude and Longitude	Albacore		Yellowfin No. Size	Skipjack No. Size	Other fish	Remarks
		No.	Size				
5/10	31°22'N 174°29'E				5 6-8#		Dolphinfish 66.5-68°F H ₂ O; 24-35 Kt. wind; jogging slow; no fish. 65°F H ₂ O; still blowing 35 Kt.; 0 fish. 64°F H ₂ O to 140'; weather moderate to 14 kts.
5/11	32°12'N 173°23'E						
5/12	32°32'N 171°00'E						
5/13	33°00'N 169°00'E						
5/14	33°30'N 167°00'E						
5/15	33°50'N 165°00'E						
5/16	34°14'N 162°59'E	36	5-12#				0 fish; 63-65°F H ₂ O; some birds; working north while trolling west. 0 fish; 64-65°F H ₂ O.
5/17	34°50'N 163°10'E	732	12-20# 14-18# (Predominate)				63-64°F H ₂ O; calm; partly cloudy; Japanese pole fleet near to westward. 65°F H ₂ O; squally weather; vessels hit what they think is the front of the migration toward the Emperor Seamount.
5/18	34°49'N 163°12'E	257	12-20#				65°F H ₂ O; overcast; 6 kt. breeze.
5/19	34°50'N 162°24'E	62	12# aug.				66.5°F H ₂ O; weather good, S.W. 14 kts.
5/20	34°47'N 162°59'E	31	5-30# 12-14# (Predominate)				66°F H ₂ O; rough weather, 30 kt. wind; rain.
5/21	34°30'N 164°38'E	24	6-35# 14# aug.				63-64°F H ₂ O; rough weather, 24 kts. northwind; 1 Japanese pole boat sighted.
5/22							No direct transmission; no fish.
5/23	32°46'N 167°14'E						0 fish; 64.5-65°F H ₂ O; sloppy weather; 20 kt. wind

Date	Latitude and Longitude	Albacore		Yellowfin No. Size	Skipjack No. Size	Other fish	Remarks
		No.	Size				
ETA Midway Island 5/28/76							
6/1	28°18'N 177°49'W						Departed Midway; equipment okay; refueled.
6/2	30°16'N 179°32'E						Blowing 20 kts. S.W.; sloppy weather; 74°F H ₂ O
6/3	31°52'N 177°09'E						Moderate to 18 kts; rough last night.
6/4	33°37'N 174°26'E	5	6#		12		Calm; 67-70°F H ₂ O; 3 breezing schools of skipjack.
6/5	34°53'N 171°12'E					1 Dolphin-fish	Sloppy weather; 65°F H ₂ O; sighted 1 Japanese longline boat and 1 Japanese baitboat.
6/6							No large change in position; very rough weather; boats drifting and jogging; moderating weather starting to move westward.
6/7	34°43'N 169°12'E						No fish; 65°F H ₂ O; 62-63°F 10'down; ran all night for warmer water.
6/8	34°45'N 165°24'E						No fish; 65°F H ₂ O
6/9	35°50'N 162°39'E						No fish; 66°F H ₂ O
6/10	36°45'N 162°06'E						No fish; 61-66°F H ₂ O; varying
6/11	37°10'N 160°28'E						No fish; 64-65°F H ₂ O
6/12	37°05'N 158°34'E						Few fish; 63-65°F H ₂ O; turning to east.
6/13	36°10'N 161°19'E						Weather moderating; sighted 3 Japanese fishboats; 64-65°F H ₂ O; Santa Ines working east on 65-66° edge; <u>Typhoon</u> the same on 64-65° edge.
6/14	35°48'N 164°05'E						No fish; 59-66°F H ₂ O; calm.

Date	Latitude and Longitude	Albacore		Yellowfin No. Size	Skipjack No. Size	Other fish	Remarks
		No.	Size				
6/15	36°32'N 167°30'E						63-65°F H ₂ O; rough weather; no life.
6/16	36°07'N 169°21'E	2	-				Some signs; 15 kts. S.W.
6/17	34°52'N 170°20'E						64.5°F H ₂ O; some bait
6/18	36°23'N 171°28'E						No fish; 64°F H ₂ O; calm.
6/20	36°25'N 168°48'E	106	7-30#				65-66°F H ₂ O; 12 kt. S.W.
6/21	37°01'N 167°13'E				20 5#		24 kt. S.W.; rain; 61-64°F H ₂ O.
6/22	36°18'N 166°30'E	1	12#		7 6#		66°F H ₂ O; 1 Japanese baitboat.
6/23	36°25'N 165°50'E	31	8#		19 --		64-66°F H ₂ O; fog; 12 kt. W.S.W.
6/24	36°12'N 165°09'E	17	8-25#		12 --		Calm overcast; 63-66°F H ₂ O; 2 kt.; eastward current.
6/25	36°10'N 164°43'E	45	8-20#		19 8#		25 kt. W.N.W.; 65-66°F H ₂ O
6/26	36°28'N 166°46'E				1 --	1 Dolphin-fish	28 kt. N.W.; rough seas; 65-66°F H ₂ O; 1 Japanese longliner; baits; birds.
6/27	36°33'N 168°32'E				1 8#		25 kt. N.W.; 64-66°F H ₂ O; 1 longliner, 2 baitboats.
6/28	35°56'N 161°18'E	241	7-20#				65°F H ₂ O; 30 albacore tagged; 1 Japanese troller.
6/29	35°14'N 169°54'E	2	13.5#		6 7.5#		66°F H ₂ O; light southerly.
6/30	34°34'N 172°12'E				11 7.5#		67°F H ₂ O; 4 longliners.

Date	Latitude and Longitude	Albacore		Yellowfin No. Size	Skipjack No. Size	Other fish	Remarks
		No.	Size				
7/1	33°00'N 175°07'E						70°F H ₂ O; calm; no birds.
7/2	31°00'N 179°00'E					2 Dolphin-fish	70°F H ₂ O; good weather.
7/3	29°19'N 179°08'W						70°F H ₂ O; some bird activity
7/4	28°12'N 177°22'W			30 12#	140 9#		Catch near Midway Island; 70°F H ₂ O; arrived Midway Island
7/8	28°17'N 177°13'W				60 8#		<u>Santa Ines</u> just outside Midway Island.
7/9	28°22'N 178°11'W			30 10-30#	33 8#		Both boats near Kure Island; 78°F H ₂ O.
7/10	30°15'N 178°52'E			10 20#	55 6-8#		74°F H ₂ O; 16 kt. E.N.E.
7/11	32°07'N 176°00'E				1 8#		76°F H ₂ O; 12 kt. E
7/12	34°17'N 173°11'E						0 fish; 75-76°F H ₂ O; 8 kts. var.
7/13	37°12'N 172°00'E				6 8-9#		1 breazing school of skipjack; 66.5-68°F H ₂ O; 4 kts. var.
7/14	38°46'N 172°49'E	31 8-10#			3 8#	2 Dolphins	65.5-67°F H ₂ O; 16 kt. wind.
7/15	TYP: 39°29'N 172°16'E	40 187	18-25# 8-10#				64.5°F H ₂ O; 20 kts. S.W.
7/16	S.I. 37°48'N 170°31'E	85	8-10#				63-65°F H ₂ O
	TYP: 39°37'N 172°41'E	2	8#				66°F H ₂ O; 20-30 kt. gusts.
	S.I. 37°31'N 170°00'E	85	8-10#		2 8#		65°F H ₂ O; rough weather.

Date	Latitude and Longitude	Albacore		Yellowfin No. Size	Skipjack No. Size	Other fish	Remarks
		No.	Size				
7/17	TYP: 39°42'N 172°18'E	37	18-20#				64-68°F H ₂ O; 28 kts; gusts to 40 kts.
		14	8-10#				63-67°F H ₂ O; rough weather; erratic H ₂ O temperature.
	S. I. 38°40'N 169°10'E	0					65°F H ₂ O; 12 kt breeze; big swell.
7/18	TYP: 40°03'N 172°55'E	14	8-10#				58.5°F H ₂ O; note low H ₂ O temperature.
	S. I. 39°35'N 171°05'E	95	18#				65°F H ₂ O; 10 kt. N.W.
7/19	34°49'N 172°17'E	41	8-10#		6 7#		64.5-65.5°F H ₂ O; rain and fog.
7/20	39°41'N 172°08'E	48	8-10#		6		62-65°F H ₂ O; 24 kt. N.W.
7/21	39°39'N 171°29'E	346	7-8#		5 7#		62.7°F H ₂ O; 10 kt. E.
7/22	39°02'N 171°21'E	46	8-10#		2 7#		64-66°F H ₂ O; 10 kt.S.E.; fog.
7/23	38°23'N 170°04'E	2	10#				64.5-65°F H ₂ O
7/24	38°37'N 167°48'E	6	8-9#		4 6#		0 fish; 67.5°F H ₂ O; 8 kt. S.W.
7/25	37°43'N 164°30'E						0 fish; 76°F H ₂ O; calm.
7/26	34°50'N 164°23'E						Calm water; Typhoon's propeller fouled by drifting line; unable to move under own power; being towed by <u>Santa Ines</u> .
7/27	33°54'N 165°47'E						80.5°F H ₂ O; calm; making 6+ kts. under tow; all going well.
7/28	32°58'N 168°40'E						Typhoon under tow by <u>Santa Ines</u> ; arrived Midway Island on 8/4 and line removed from prop; no damage.
7/29 - 8/4							

Date	Latitude and Longitude	Albacore		Yellowfin No. Size	Skipjack No. Size	Other fish	Remarks
		No.	Size				
8/5	27°45'N 175°52'W			15 8#	10 4-5#		81°F H ₂ O; calm; departed Midway Island; trolled to Pearl and Hermes Reef.
8/6	27°11'N 175°06'W			49 20-30#	2 6#		79°F H ₂ O; 5 kt. S.E.
8/7	26°15'N 174°05'W			34 8-10#	8 5-6#		North of Lisianski Island; 79°F H ₂ O; 10 kt. E.
8/8	25°53'N 173°17'W			12	4	1+	Some 50# fish similar to anberjacks; 80°F H ₂ O; calm.
8/9	25°30'N 171°45'W				33	1 wahoo	79.5°F H ₂ O; 12 kt. N.W.; 3 hours from Laysan Island.
8/10	25°22'N 170°14'W			4 12-13#	14	1 wahoo	80°F H ₂ O; 5 kt. N.E.
8/11	25°24'N 169°08'W			22 6-8# 4 40#	12		79.5°F H ₂ O; 13 kt. E.N.E.
8/12	24°43'N 167°39'W			4 8-9#	5 5#	1 Dolphin	79.5°F H ₂ O; 15-20 kts. E. wind.
8/13	23°30'N 166°03'W			18 8-9#	8		Heading toward Necker Island; 79.5°F H ₂ O; 10 kts. N.E.
8/14	23°36'N 164°38'W			23 25-45#	11 16-11#		80°F H ₂ O; calm; off Necker Island
8/15	23°17'N 163°18'W						No fish; halfway to Nihoa Island; 79°F H ₂ O; 18 kt. E.N.E.
8/16	22°36'N 161°06'W				55 5-6#		78.5°F H ₂ O; 14 kt. E.N.E.
8/17	22°30'N 159°15'E						No fish; heading for Honolulu; 79°F H ₂ O; calm.
8/18							Arrived Honolulu.

Oceanographic Conditions

Oceanographic conditions in the western North Pacific were much different during 1976 than they have been during the past several years. Japanese scientists attribute this alteration of oceanographic conditions largely to a change in the patterns of the Kuroshio current. The variation in oceanographic conditions appears to have markedly influenced the migratory patterns of albacore in 1976 in the western North Pacific resulting in, among other things, an apparent low availability of albacore in the Emperor Seamount chain during late May through July 1976 and consequent reduced catches by the U.S. jig vessels.

Sections of the vertical distribution of temperature determined from bathythermograph observations and albacore catches made by U.S. albacore trolling vessels operating in the western North Pacific in late May and June 1975 and 1976 are given in Figure 3. The sections shown in Figure 3 are for a southeast to northwest transect extending from a region north of the Hawaiian Island chain, over the Emperor Seamount chain and to about 300 miles west of the Emperor Seamount chain.

The vertical ocean thermal structure was similar in 1975 and 1976 for the southeastern half of the transect, however, marked differences between the two years are evident in the northwestern half of the transect. In 1975 in the northwestern portion of the transect the 58° and 60°F isotherms showed a marked shoaling, followed by an abrupt deepening and then shoaling, another deepening and another abrupt shoaling to form

the general shape of an elongated "W". There was another deepening of the isotherms westward of the "W". The location of the "W" pattern in the vertical distribution of the 58° and 60°F isotherms coincided with the crossing of the Emperor Seamount chain from southeast to northwest. Also there was a well-developed temperature front with a temperature drop of several degrees near the right upright of the "W" and a somewhat lesser developed temperature front near the left upright of the "W". The "W" shape in the vertical distribution of the 58° and 60°F isotherms and the surface temperature fronts probably are associated with the boundaries of Transition Zone waters between North Pacific and Central Pacific waters; however, a number of other oceanographic processes and phenomena may also be involved.

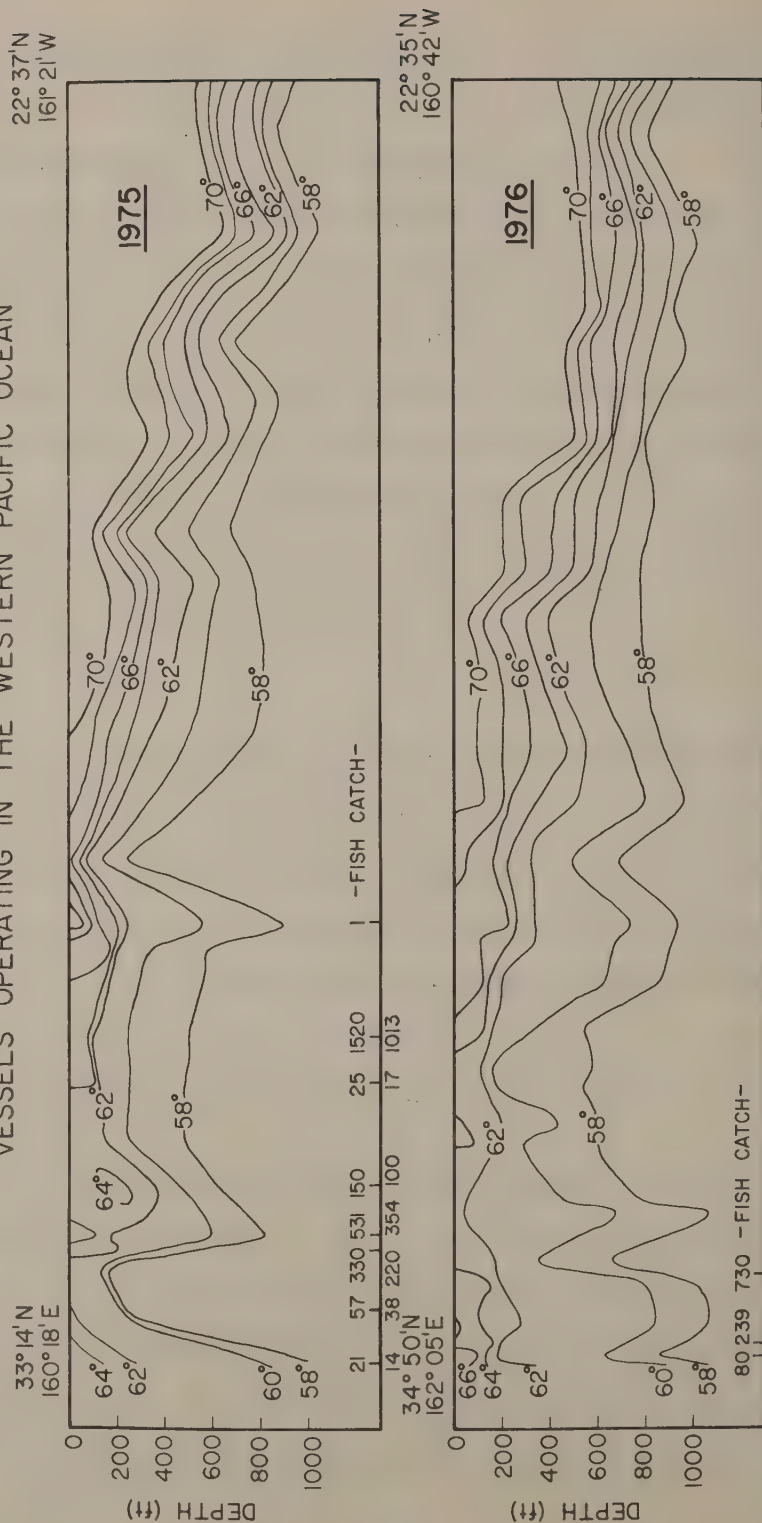
In 1976 there was no pronounced alternation in the shoaling and deepening of the 58° and 60°F isotherms to form a "W", and there were no sharp temperature fronts evident at the surface. Also, the 58°F isotherm, which in 1975 shoaled to depths of about 200 feet near the uprights of the "W", did not shoal above about 600 feet in 1976.

Albacore Catches in Relation to Oceanographic Conditions

The highest daily total catches of albacore made during the 1975 operations were associated with the "W" shape of the 58° and 60°F isotherms and surface temperature frontal features located over the Emperor Seamount chain (see top section in Figure 3. Fish catch numbers in both sections in Figure 3 are total daily catches; in the section for 1975 the catch values given above the bottom line are totals for all three vessels

Figure 3.

VERTICAL DISTRIBUTION OF TEMPERATURE DETERMINED FROM BATHYTHERMOGRAPH
OBSERVATIONS, AND ALBACORE CATCHES, MADE BY U.S. ALBACORE TROLLING
VESSELS OPERATING IN THE WESTERN PACIFIC OCEAN



and the values below the line have been standardized to two vessels for more direct comparison with 1976 catch values). In 1976 the highest daily total catches of albacore were made somewhat east of where they were made in 1975, but still in the vicinity of the Emperor Seamount chain. Also, the highest catches were associated with a weak shoaling of the 58° and 60°F isotherms, i.e. where the 58°F isotherm shoaled from about 1,000 feet to 700 feet and 1,000 feet to 850 feet.

Summary and Discussion

It appears that the alteration of oceanographic conditions in the western North Pacific in 1976 markedly influenced the migratory behavior and patterns of albacore in that sector of the Pacific. These factors apparently affected the fishing success of the U.S. exploratory jig fishing vessels operating in the vicinity of the Emperor Seamount chain. Evidence indicates that albacore did not migrate through the Emperor Seamount area in substantial numbers until several months later than has occurred in recent years and after the charter for the U.S. vessels had terminated.

The commencement, seasonal movement, and ending of the Japanese live-bait fishery were also different in 1976 than has been observed in past years. The fishery was later-than-usual in getting started, it remained closer to the Japanese home islands and did not progress offshore (eastward) as fast as normal, and catches were still being made in November, 1976 (the fishery in recent years has ended in June or July). According to the Japanese fishery trade periodical "Suisan Keizai Shinbun",

December 8, 1976, Japanese pole-and-line vessels were having good fishing in November for albacore in waters near the Emperor Seamount chain in the vicinity of 41° - 42° N, 167° - 168° E. A total of 25 vessels completed two cruises by mid-November and a third cruise was underway with more vessels participating.

The pattern of tagged albacore recoveries made in 1976 by Japanese baitboats in the western Pacific, of tagged albacore released in the eastern Pacific during the joint NMFS/AFRF tagging program, also shows that the Japanese live-bait fishery progressed offshore later than usual and that the fishery did not move into the longitudes of the Emperor Seamount chain until after July (see Figure 4). Figure 4 shows that tagged albacore recovered between March-June (shown as open circles) were mostly made west of about 158° E and recoveries made between July-November (shown as black triangles) were made east of 160° E and mostly in the vicinity of the Emperor Seamount chain near 168° - 170° E. The majority of the tag returns made during the latter time period were made in late October and early November.

Figure 4.

